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Research Article

Wildlife at risk: A media-based analysis of wildlife poaching in Romania

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Abstract

The conservation of endangered species is under growing threat from poaching, which has become more complex and globally widespread. In Romania, escalating human–wildlife conflicts and diminished public support for wildlife are driving an increase in poaching. Moreover, the country lacks a centralized and official database to monitor and document poaching events. In this study, we aim to contribute to the understanding of poaching in Romania by (1) identifying the wildlife species most affected by poaching, exploring the incentives behind illegal hunting and fishing, and assessing the methods involved; (2) analyzing the spatial distribution of poaching to identify hotspots of illegal hunting and fishing; and (3) proposing practical and ethical strategies to mitigate and minimize poaching. We examined poaching incidents reported in Romania by national media between 2007 (following the country's accession to the European Union) and 2024. A series of statistical analyses, including Correspondence Analysis (CA), was conducted to explore patterns within the collected data. The findings indicate that ungulates and aquatic species are primary targets of poaching, largely driven by economic motivations associated with the trade in meat and other animal-derived products. In addition, protected species such as large carnivores are frequently targeted by poachers due to human–wildlife conflicts, particularly those involving livestock predation and low levels of tolerance among local communities. The spatial analysis identifies key poaching hotspots requiring urgent intervention. This study provides a comprehensive overview of poaching in Romania, contributing to the development of a national anti-poaching strategy with policy-relevant recommendations for decision-makers.

Key words: Biodiversity, illegal fishing, illegal hunting, mass media, poaching, Romania

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Introduction

Poaching creates a significant challenge in the conservation of endangered species (Estes et al. 2011; Chapron and Treves 2016; Rizzolo et al. 2017) due to its growing complexity and global reach (Carter et al. 2017). Widespread poaching significantly contributes to the global decline of species (Challender and MacMillan 2014; Ghoddousi et al. 2017; Morton et al. 2021), damaging ecological interactions and the functionality of ecosystems (Estes et al. 2011).

Understanding the complexity of poaching is essential for developing effective conservation practices and strategies to address the social challenges it presents (Montgomery 2020; Neagu and Rozylowicz 2025). Confronting poaching is challenging, as it is driven by diverse social, cultural, and economic incentives (Nellemann et al. 2014; Carter et al. 2017). Key drivers encompass poverty, the absence of alternative economic opportunities (Duffy et al. 2016; Hübschle 2017; Lunstrum and Givá 2020), and a widespread distrust of authorities (de Juan et al. 2022). Furthermore, local communities' lack of acceptance, along with fear, significantly contributes to the increase in illegal hunting incidence (Eliason 1999, 2020; Browne-Nuñez et al. 2015; Carter et al. 2017).

Romania hosts impressive biodiversity, including a substantial number of protected species (Iojă et al. 2010; Stanciu et al. 2023). The conservation of habitats and species in Romania is achieved primarily under provisions of the EU Habitats and Birds Directives (Council of the European Communities 1979; European Commission 1992), which became mandatory after the country joined the European Union in 2007. Hunting and fishing are regulated in Romania by Law No. 407/2006 on Hunting and Game Protection and Law No. 176/2024 on fishing and the protection of living aquatic resources. These norms establish what is legally defined as poaching (Parliament of Romania 2006, 2024a).

The increasing incidences of human–wildlife conflicts and the declining acceptance of wildlife are contributing to a rise in poaching within Romania (Salvatori et al. 2020; Successful Wildlife Crime Prosecution in Europe 2022). Identifying and prosecuting poaching events is a complex process (Kahler et al. 2013; Chapron and Treves 2016), requiring substantial resources (Challender and MacMillan 2014) and advanced technologies (Kamminga et al. 2018). Presently, Romania lacks an official database for recording events of illegal hunting (Successful Wildlife Crime Prosecution in Europe 2022). Furthermore, notwithstanding the significant ecological and social impacts (Cardoso et al. 2021), few national studies focus on poaching events. This is due largely to a lack of data (Duffy et al. 2016), resulting in critical knowledge gaps and an underestimation of the poaching threats (Lavadinović et al. 2021).

Mass media plays an important role in communicating information to the public about biodiversity conservation efforts (Maxwell et al. 2016; Toivonen et al. 2019; Morini et al. 2023) and in shaping perceptions of wildlife (MacFarlane and Rocha 2020). When official data are deficient, mass media reports can become a useful resource for documenting poaching events. These reports are often used for data extraction in various studies focused on illegal hunting, such as those conducted by Datta (2022), Easter et al. (2023), Engelbrecht (2020), Morini et al. (2023), and Paudel et al. (2022).

In this study, we aim to contribute to improving the understanding of poaching in Romania by (1) identifying the wildlife species most affected by poaching, exploring the incentives behind illegal hunting and fishing, and assessing the methods involved; (2) analyzing the spatial distribution of poaching to identify hotspots of illegal hunting and fishing; and (3) proposing practical and ethical strategies to mitigate and minimize poaching.

This study offers significant insights into vulnerable species that need enhanced protection from illegal hunting and fishing practices. Additionally, it explores a seldom-discussed aspect of poaching: the incentives behind it (Lavadinović et al. 2021), which can vary based on various factors, such as species poached or stan-

dard of living (Janssen et al. 2024). Understanding these incentives is essential for addressing the root causes of environmental crimes (Duffy et al. 2016). Our findings can serve as a foundation for the development of a poaching mitigation strategy, providing useful insights for policymakers (Chapron and Treves 2016).

Methods

To understand poaching events in Romania, we conducted a comprehensive analysis of mass media articles published between 2007 (following the country's accession to the European Union) and 2024, focusing on national and local online publications (Sakurai et al. 2013). Our analysis includes 58 local publications, ensuring that there was at least one publication from each county in Romania, as well as eight prominent national-level publications.

We used the keywords "poaching," "illegal hunting," and "illegal fishing" (in the Romanian language) to search for relevant articles. We only included articles that reported on events that occurred between 2007 and 2024. We found a total of 7,558 articles reporting poaching events. We further reviewed article titles to exclude those that were unrelated to poaching, occurred outside Romania, or fell outside the analyzed period. We also removed duplicate articles to ensure no poaching events were counted more than once.

After finalizing the filtering process, the database encompassed 1,105 articles addressing poaching. For each event, we recorded: (1) location and date of the event; (2) species involved, grouped into categories (ungulates, large carnivores, other mammals, fish and other aquatic species, birds, and unknown); (3) type of poaching event reported (i.e., individuals apprehended while poaching, investigations conducted at alleged poachers' residences or belongings, keeping a wild animal in captivity, or the use of unauthorized or rigged traps); (4) methods used by the poachers (such as rigged traps, shooting, hunting using edged or blunt weapons, fishing by various methods, or poisoning) (Datta 2022; Zisadza et al. 2025); (5) incentives behind the actions (Easter et al. 2023; Zisadza et al. 2025), as understood from the text of the article (such as commercialization of meat and animal-derived products, trophy hunting, self-defense, or low tolerance); and (6) the final legal solution of the event. Data were grouped into categories and coded for statistical analysis. The incentives or methods used were included in the database only when they were explicitly mentioned or could be clearly inferred from the media article. In 650 articles, the incentives behind the poaching events could not be identified or inferred.

Although the analysis covered 1,105 media articles on poaching, the number of poaching events exceeded the number of reviewed articles. This is because some media articles reported multiple distinct poaching events, either involving species from different taxonomic groups (e.g., a hare and a chamois) or involving different methods or incentives. In such instances, each distinct event was counted in the database.

The analysis of poaching in Romania is still in its early stages, hindered by a lack of official data (Successful Wildlife Crime Prosecution in Europe 2022). Our research is based on media coverage of poaching events, which may not fully represent reality due to underreporting or overreporting driven by a newsworthiness bias (Weidmann 2015; Dempster et al. 2022; Paudel et al. 2022). Furthermore, updates on the resolution of these events are seldom made pub-

lic (Velin et al. 2021), complicating our understanding of how authorities address and manage poaching.

To visualize the time distribution of poaching events and the distribution of events by taxa, we utilized the ggplot2 R package (Wickham 2016). We used the networkD3 R package to create a Sankey diagram illustrating the relationship between the methods used in poaching events and the species affected (Allaire et al. 2025).

To analyze the relationship between the variables statistically, we performed a correspondence analysis (CA) using the FactoMineR R package (Lê et al. 2008). Correspondence analysis is a valuable tool commonly used in ecological studies (Greenacre 2010a; van Dam et al. 2021) for effectively visualizing data association (Greenacre 2010b). We examined two dimensions of the CA plot: one that compares poaching event typologies with the categories of species involved, and another that examines the underlying incentives for poaching in relation to the targeted species. We analyzed the proximity of variables within the two dimensions of the plot, where shorter distances between variables indicate a stronger similarity (Greenacre 2017). This method enabled us to identify patterns of poaching events based on the species categories. To visualize the spatial distribution of reported poaching events across species categories, we conducted an exploratory spatial analysis by aggregating the number of events at the county level and representing them using choropleth maps. The cartographic materials were created in ArcGIS Pro 3.1.3 (Esri Inc.) using vector data (i.e., county boundaries), obtained from the Romanian Government Open Data Portal (Data.Gov.Ro 2024).

Results

We identified 1,105 mass media articles reporting poaching events from 2007 to 2024. Between 2010 and 2014, there was a notable increase in the number of poaching-related articles, with a peak in 2011, which accounted for 108 articles (i.e., 9.77%) (Suppl. material 1).

Ungulate species were the most frequently reported in poaching events, appearing in 461 articles (i.e., 41.72%). The most reported poached species was the roe deer (*Capreolus capreolus*), mentioned in 249 articles (i.e., 22.53%), followed by the wild boar (*Sus scrofa*), mentioned in 181 articles (i.e., 16.38%).

Fish and other aquatic species are the second most poached group, with 373 articles (i.e., 33.76%) reporting poaching. Illegal fishing events often involve the Prussian carp (*Carassius gibelio*), mentioned in 70 articles (i.e., 6.33%), followed by sturgeon species in 43 articles (i.e., 3.89%).

Mammals (excluding large carnivores and ungulates) were mentioned in 114 articles (i.e., 10.32%) that reported poaching. The most poached species was the hare (*Lepus europaeus*), recorded in 85 articles (i.e., 7.69%), followed by the red fox (*Vulpes vulpes*), which was recorded in 19 articles (i.e., 1.72%). Bird species were the subject of 100 articles (i.e., 9.05%). The most frequently mentioned species was the common pheasant (*Phasianus colchicus*), which was featured in 39 articles (i.e., 3.53%).

Large carnivore species accounted for 78 articles reporting illegal hunting (i.e., 7.06%), with the majority involving the brown bear (*Ursus arctos*) in 69 articles (i.e., 6.24%) and the gray wolf (*Canis lupus*) in 10 articles (i.e., 0.90%). 66 articles on poaching (i.e., 5.97%) involved unspecified taxa. In these articles,

general terms such as "game," "animal," or "trophy" were used. The frequency of each species mentioned in the articles about poaching is illustrated in Fig. 1.

In terms of spatial distribution, the highest number of events was reported in Tulcea County, which overlaps the Danube Delta, with 103 articles (i.e., 9.32%), followed by Bacau County with 66 articles (i.e., 5.97%) and Hunedoara County with 43 articles (i.e., 3.89%). The lowest percentages were reported in Bucharest (capital city), Ilfov, Giurgiu, and Covasna counties, with each recording fewer than 1% of the total reviewed articles.

Bacau County reported the highest number of events involving ungulates, totaling 31 articles (i.e., 6.72% of ungulate-related articles), followed by Hunedoara County with 28 articles (i.e., 6.07%). In the case of large carnivores, Mures County recorded eight articles (i.e., 10.26% of large carnivore-related articles), while both Brasov and Bacau counties documented seven articles each (i.e., 8.97%). Illegal hunting events involving other mammal species were also reported, particularly in the southern and southeastern regions of Romania. The highest number of such reports was recorded in Dolj and Dambovita counties (eight articles each, i.e., 7.02% of mammal-related articles), followed by Ialomita and Suceava counties (seven articles each, i.e., 6.14%) (Fig. 2).

Illegal fishing was most prevalent in Tulcea County, with 88 media articles addressing this issue (i.e., 23.59% of illegal fishing-related articles). Bacau County recorded 22 articles (i.e., 5.90%), and Constanta County recorded 21 articles (i.e., 5.63%). For bird species, Galati County had the highest number of events reported in the mass media, totaling 12 articles (i.e., 12% of bird-related articles), followed by Braila County with eight articles (i.e., 8%) (Fig. 2).

We classified the poaching-related articles into five distinct event types, based on the nature of the event reported. The most common type involved individuals apprehended while conducting illegal hunting or fishing, reported

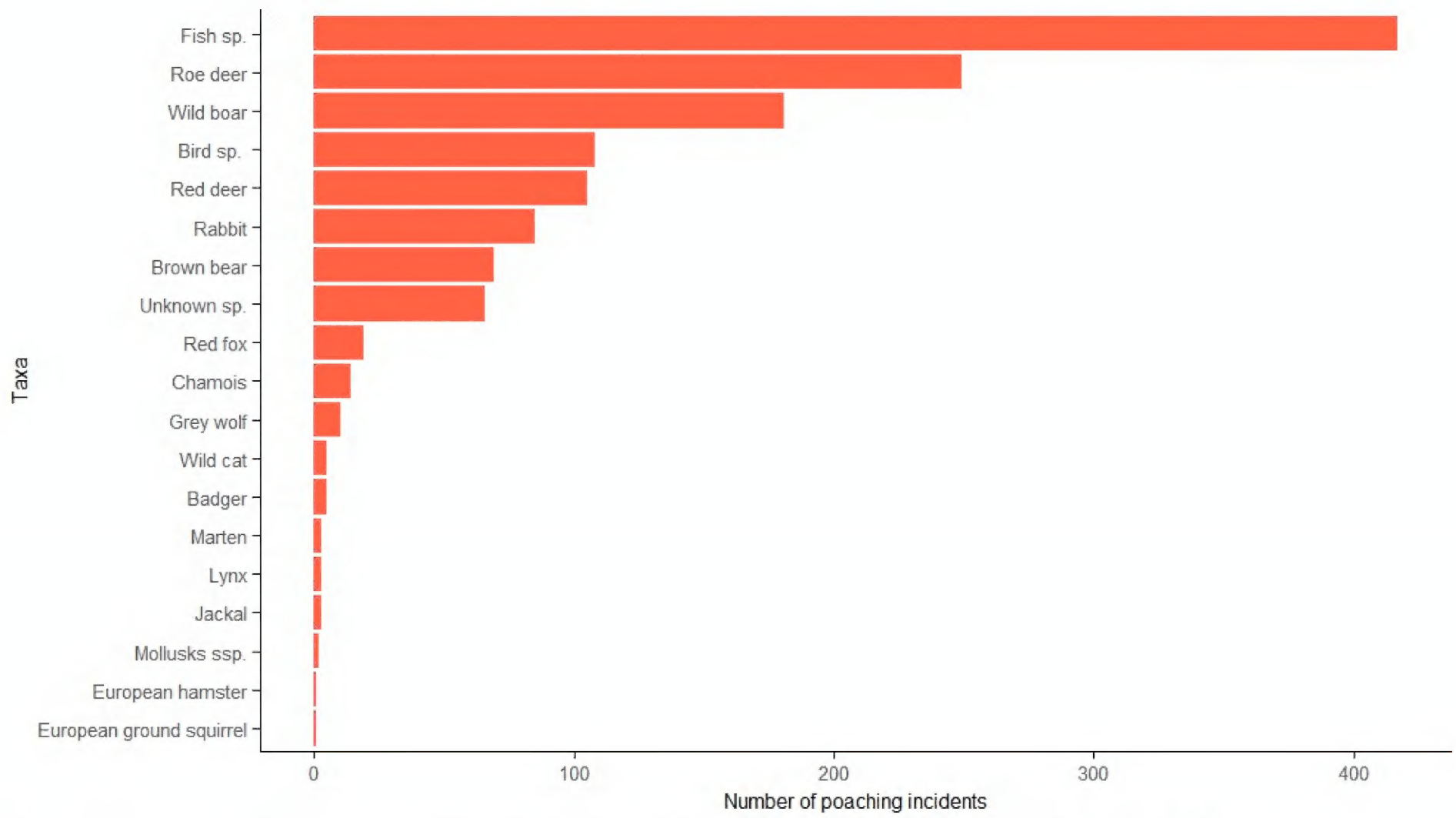


Figure 1. Taxa reported in mass media articles addressing poaching events from 2007 to 2024 in Romania.

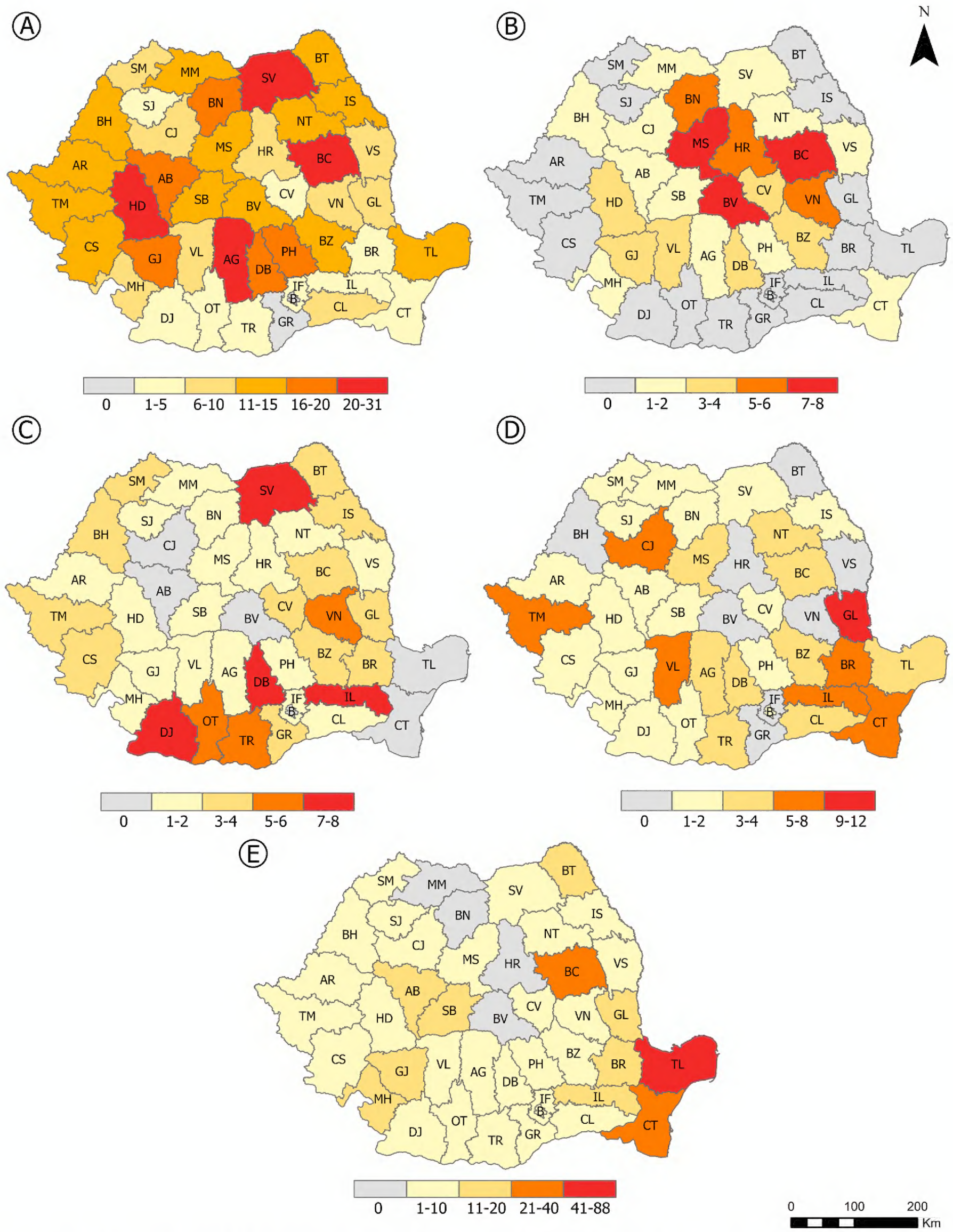
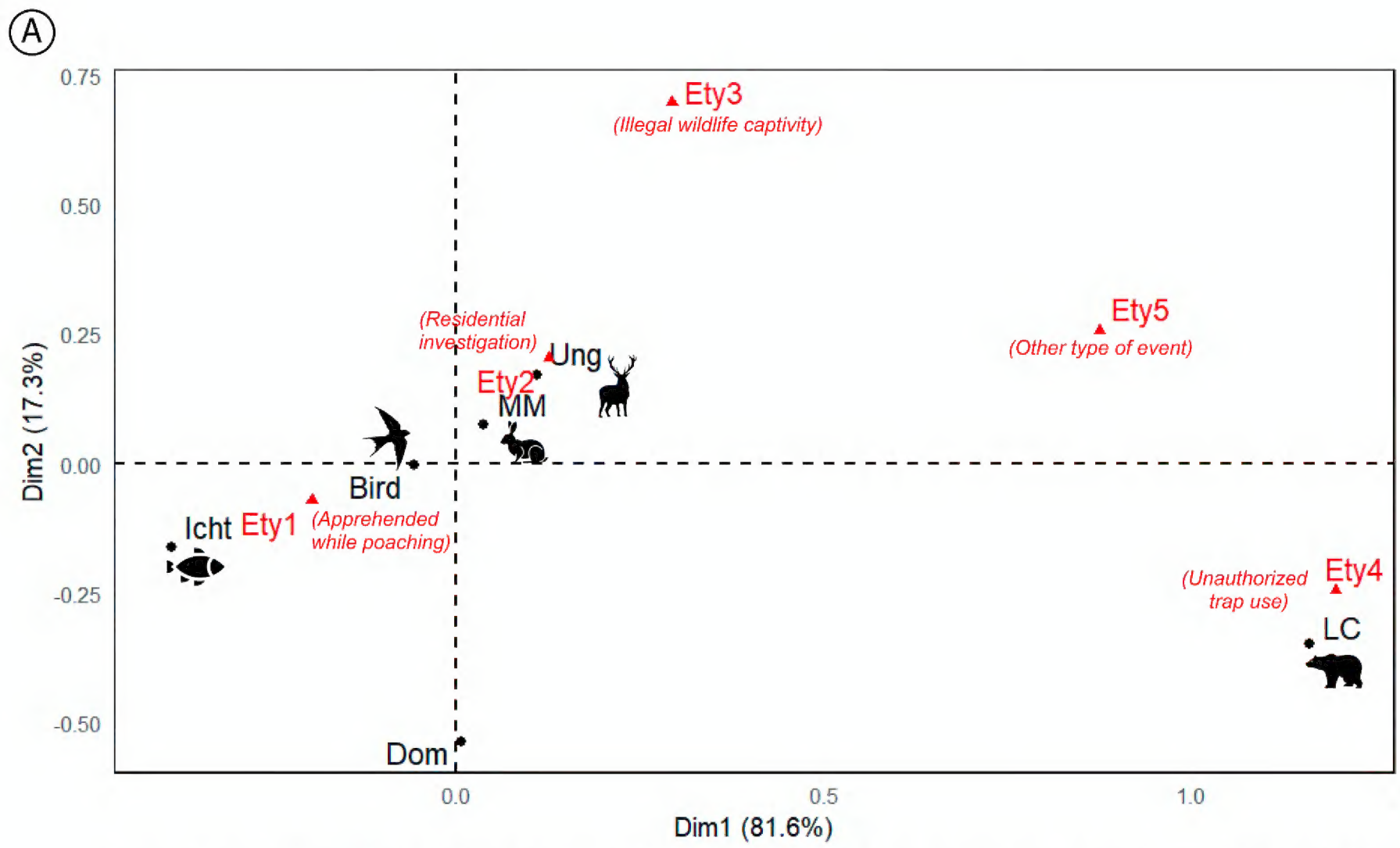
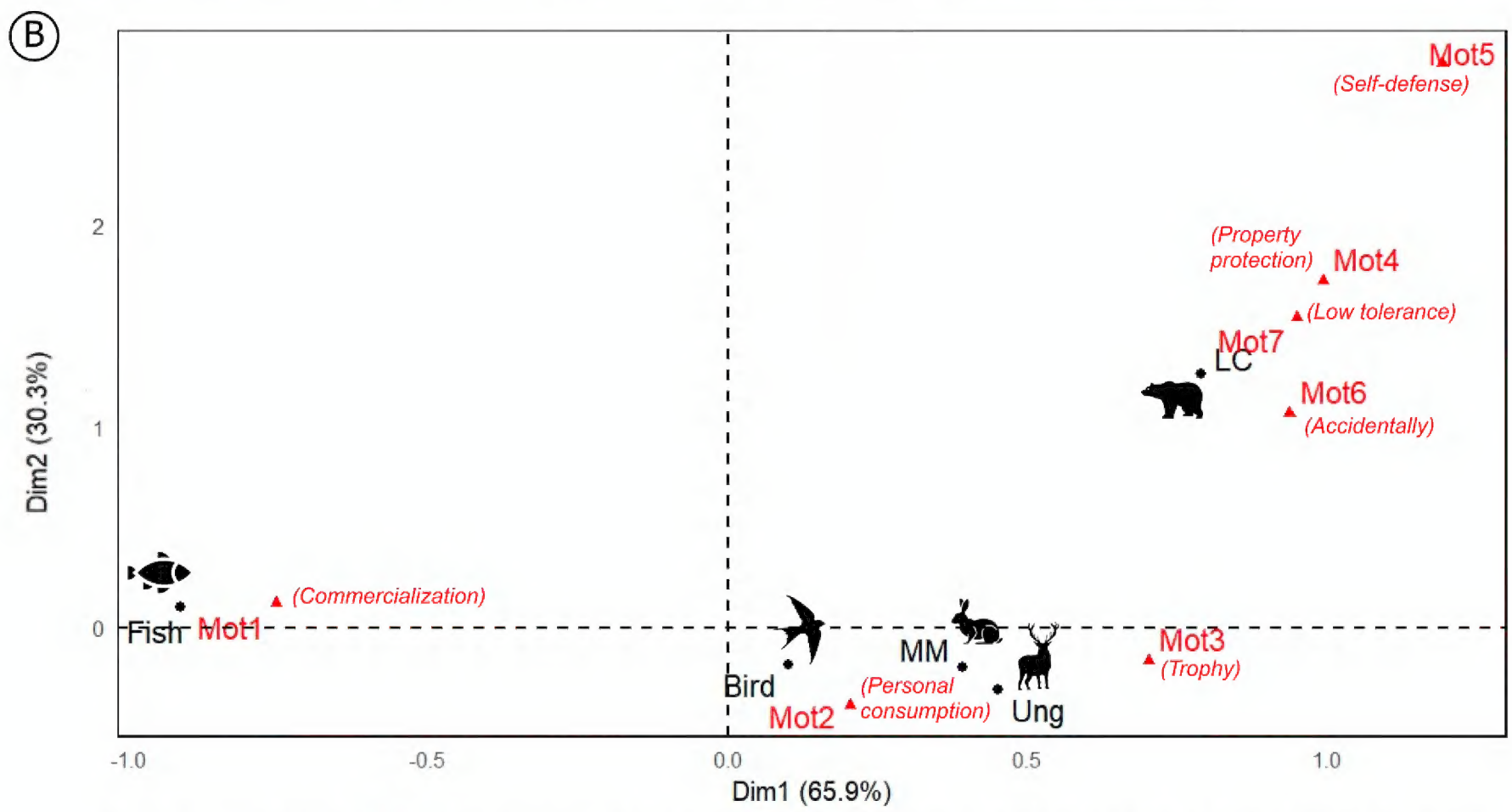


Figure 2. Distribution of poaching events in Romania, as reported by mass media between 2007 and 2024, by species categories. **A.** Ungulates; **B.** Large carnivores; **C.** Other mammals; **D.** Birds; **E.** Fish and other aquatic species.

in 787 articles (i.e., 71.22%), followed by residential investigations conducted at the residences of suspected poachers in 215 articles (i.e., 19.46%). The remaining 11.22% of events involved the use of unauthorized or rigged traps (88 articles, i.e., 7.96%), unauthorized captivity of protected wildlife species (28 articles, i.e., 2.53%), and other types of events (eight articles, i.e., 0.72%).



● = species categories; ▲ = poaching event type. Ety1 - Individuals apprehended while conducting unauthorized hunting or fishing; Ety2 - Residential investigations conducted at the homes of suspected poachers; Ety3 - Unauthorized captivity of protected wildlife species; Ety4 - Use of unauthorized/rigged traps; Ety5 - Other type of event.



● = species categories; ▲ = poaching incentives. Mot 1 - commercialization of meat and animal-derived products; Mot 2 - individual use of meat and animal-derived products; Mot 3 – trophy hunt; Mot 4 - protection of property, livestock, and crops; Mot 5 – self-defense; Mot 6 - accidents or species misidentification claimed by the accused poacher; Mot 7 – low tolerance toward the species.

Figure 3. Correspondence analysis plot showing. **A.** The relationship between species categories (black dots) and poaching event types (red triangles); **B.** The relationship between species categories (black dots) and poaching incentives (red triangles).

The correspondence analysis used to explore the relationship between the species categories and poaching event types explains 98.9% of the data variance (Dimension 1: 81.6%, Dimension 2: 17.3%) (Fig. 3). Dimension 1 reveals a strong

association between large carnivore species and poaching events that involve the use of unauthorized or rigged traps (Ety4). Conversely, Ety1 (i.e., individuals apprehended while conducting unauthorized hunting or fishing) aligns closely with fish and other aquatic species (Fish) and bird species (Bird). Ety2 (residential investigations conducted at the residences of suspected poachers) positions itself centrally, near other mammal species (MM) and ungulate species (Ung).

In 650 articles (i.e., 58.82%) of the media articles analyzed, the incentives behind poaching were unclear and were therefore categorized as unknown. The other 455 articles (i.e., 41.18%), for which at least one incentive was identified, were grouped into seven categories. The primary incentives included the commercialization of meat and animal-derived products, noted in 212 media articles (i.e., 19.19%); the individual use of meat and animal-derived products, present in 137 articles (i.e., 12.40%); and trophy hunting, which appeared in 131 articles (i.e., 11.86%).

We also conducted a correspondence analysis (Fig. 3) to explore the relationship between species categories and the underlying incentives behind poaching events (Mot 1–Mot 7). The analysis revealed that the two dimensions explain 96.2% of the variance, with Dimension 1 accounting for 65.9% and Dimension 2 accounting for 30.3%. On the right side of Dimension 1, Mot 4 (protection of property, livestock, and crops), Mot 5 (self-defense), Mot 6 (accidents or species misidentification claimed by the accused poacher), and Mot 7 (low tolerance toward the species) are tightly grouped around large carnivores (LC). In contrast, Mot 1 (commercialization of meat and animal-derived products), positioned on the left side, is closely aligned with fish and other aquatic species categories (Fish). Mot 2 (individual use of meat and animal-derived products) and Mot 3 (trophy hunting) are more common for birds, ungulates, and other mammal categories.

We evaluated the methods employed by poachers, categorizing them into 12 distinct groups (Table 1). Of these groups, 10 methods were applied to terrestrial mammal and bird species, one was related to fish and other aquatic species, and one category included articles in which the methods used were unclear (Table 1; Fig. 4). Several articles described multiple methods (e.g., the use of rigged traps alongside shooting).

Table 1. Methods used in poaching events as reported by Romanian mass media (2007–2024).

Method	Number of articles	%
Shooting	497	44.98
Illegal fishing	373	33.76
Use of unauthorized/rigged traps	104	9.41
Hunting with dogs	78	7.06
Capturing and keeping in captivity	36	3.26
Unknown method	28	2.53
Hunting with edged or blunt weapons (e.g., knives, axes, or clubs)	10	0.90
Maltreatment of the animal	7	0.63
Hunting with a crossbow	5	0.45
Intentional collision involving a motor vehicle	4	0.36
Poisoning	4	0.36
Intentional destruction of nests or eggs	1	0.09

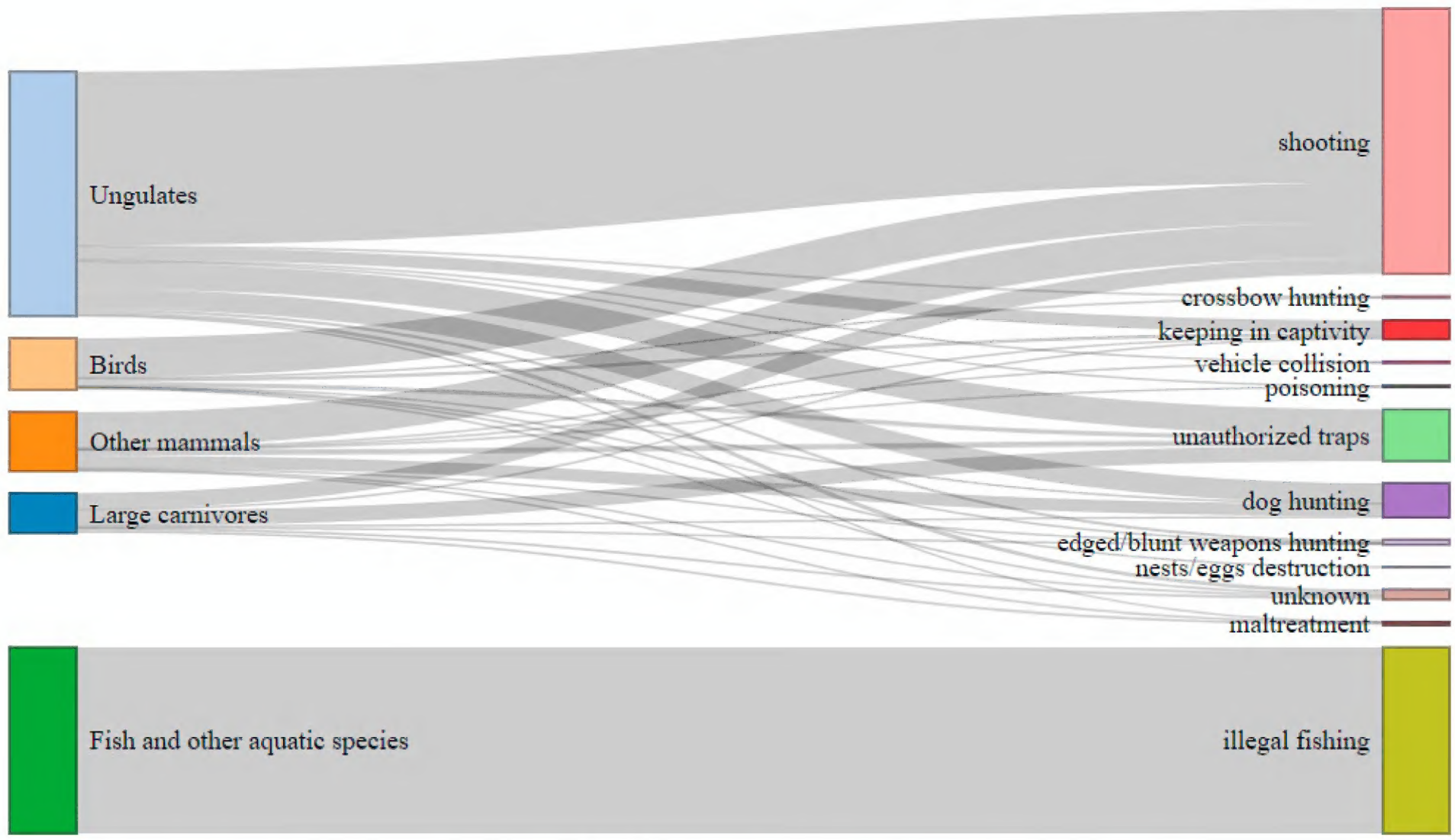


Figure 4. Sankey diagram illustrating the types of methods used in poaching by species categories.

Discussion

In Romania, poachers primarily target ungulate and fish species due to the value of their meat and derived products (Zhang et al. 2008; Gandiwa et al. 2013; Zisadza et al. 2025). Several protected species, such as large carnivores, are illegally hunted for trophies and due to the low tolerance within local communities (Pop 2019; Pop et al. 2025).

Ungulate species are the most frequently involved in poaching events in Romania, particularly the roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*). These species are mainly targeted for trophy hunting and bushmeat (Hoffman and Cawthorn 2012; Gandiwa et al. 2013; Zisadza et al. 2025). The highest rate of poaching for ungulate species occurs during the cold months (January–March; October–December), primarily due to reduced agricultural activity, which represents a significant source of food and income for local communities. Poaching events involving ungulate species are also incentivized by the desire for trophies. A concerning issue regarding trophy hunting is that poachers typically target larger specimens, which are deemed more valuable (Milner et al. 2007; Palazy et al. 2012).

Ungulate species can turn out to be problematic due to overpopulation and crop damage (Carpio et al. 2021), which leads to reduced acceptance among local communities (Kansky et al. 2014). However, excessive hunting of these species disrupts ecosystems, particularly by impacting predator populations due to a reduction in their food sources (Carbone et al. 2011; Ghoddousi et al. 2017; Kachel et al. 2017). Moreover, this can force large carnivore species to seek alternative food sources that are easier to obtain, such as livestock, generating human–large carnivore conflicts (Khorozyan et al. 2015; Soofi et al. 2019).

The brown bear (*Ursus arctos*) was the primary target of poachers among large carnivores, with 69 reported events, far surpassing the combined total

of the other three species: the gray wolf (*Canis lupus*), the Eurasian lynx (*Lynx lynx*), and the jackal (*Canis aureus*). In Romania, although brown bears are a strictly protected species (Government of Romania 2007), a yearly harvesting quota of 426 individuals has been established for 2024 and 2025 for population management. An additional 55 permits are reserved for off-quota hunting when bears pose a direct threat to human safety or damage property (Parliament of Romania 2024b; Pop et al. 2025). Despite these regulations, brown bear management remains inadequate, failing to promote coexistence (Neagu and Rozylowicz 2025) and leading to instances of poaching.

Since large carnivores are socially controversial (Chapron et al. 2014) due to an increase in conflicts in Romania (Hartel et al. 2019; Pătru-Stupariu et al. 2020; Neagu et al. 2022), poachers often resort to setting up rigged traps, such as snares, to entrap individuals that venture close to human settlements (Pop 2019; Becker et al. 2024). Using such unethical methods may also endanger other species that are entrapped and not targeted (Masolele 2018). Furthermore, out of the seven articles reporting poaching events that involved animal maltreatment, four involved brown bear cubs, and one involved a lynx kitten, highlighting the declining human acceptance of these species.

The hare (*Lepus europaeus*) is the most frequently mentioned species from the other mammals category. Poachers hunt it particularly for its meat and often for commercial purposes. The most used methods are shooting and hunting with trained dogs, a technique long utilized by the nobility for harvesting hares (Pedersen et al. 2024). Although the hare is not listed as a protected species, its population may decline due to poaching, intensive agricultural use, and harmful practices, such as stubble burning during the breeding period (Smith et al. 2005; Dhami et al. 2023). These factors also negatively affect other species, including the European hamster (*Cricetus cricetus*), the European ground squirrel (*Spermophilus citellus*), and various bird species. These species serve as primary prey for mesopredators such as the red fox (*Vulpes vulpes*) or the golden jackal (*Canis aureus*) (Lanszki et al. 2006; Lloveras et al. 2012); therefore, the hare's overexploitation can disrupt predator population dynamics (Lindström et al. 1994; Panek 2013).

The southeastern region of Romania reported the highest concentration of bird poaching events, particularly in Galati, Braila, Tulcea, Constanta, and Ialomita counties, which collectively account for one-third of all avian poaching events. Galati County alone recorded the most events. This concentration correlates with the region's rich wetland ecosystems, including numerous lakes, Natura 2000 Special Protection Areas (SPAs), and Ramsar sites such as the Small Wetland of Braila. This region encompasses the Danube Delta, a UNESCO Biosphere Reserve and Ramsar site (Council of Europe 2000), and is traversed by the Via Pontica migration corridor, a critical stopover for numerous strictly protected migratory bird species (LIFE Safe Grid for Burgas 2025). The abundance and diversity of bird species in these internationally recognized protected areas make them attractive targets for poachers (Bairlein 2016; Vickery et al. 2014).

The common pheasant (*Phasianus colchicus*) was the most frequently reported poached bird species. This alien gamebird was introduced for hunting due to the high value of its meat (He et al. 2021; Gao et al. 2024; Societatea Ornitologica Romana 2025) and is currently subject to regulated hunting in Romania, with seasonal restrictions (Parliament of Romania 2006). Furthermore,

24 articles documented poaching of strictly protected species for which hunting is prohibited throughout the year, including the mute swan (*Cygnus olor*), red-breasted goose (*Branta ruficollis*), red-footed falcon (*Falco vespertinus*), and hawk species (*Accipiter* spp.). Poaching incentives differed substantially across species groups. While most gamebird and waterfowl poaching was economically incentivized (e.g., driven by meat consumption or trade), raptor persecution stemmed primarily from human–wildlife conflict. Low tolerance for these predators, which prey on domestic poultry and trigger economic losses, was the primary driver of illegal killings. In contrast, songbirds, including the song thrush (*Turdus philomelos*), starling (*Sturnus vulgaris*), and skylark (*Alauda arvensis*), were captured using rigged traps for the pet trade (Nijman et al. 2018; de Oliveira et al. 2020).

Among fish and other aquatic species, the common carp (*Cyprinus carpio*) was the most frequently poached, typically harvested in large quantities using prohibited monofilament nets that exceeded the recreational fishing limit of 5 kg per day (Parliament of Romania 2024). As indicated by the correspondence analysis, illegal fishing was predominantly driven by economic incentives, with commercial-scale operations using banned equipment such as monofilament nets.

Forty-three media articles documented sturgeon poaching, a particularly concerning trend given that all sturgeon species are strictly protected under international agreements, including the Bern Convention (Council of Europe 1979) and CITES (CITES 1973). The Danube River hosts the last remaining functional populations of beluga (*Huso huso*), Russian sturgeon (*Acipenser gueldenstaedtii*), and stellate sturgeon (*Acipenser stellatus*) (Ludwig et al. 2023). Nearly half of the reported sturgeon poaching events occurred in Tulcea County, which encompasses the UNESCO-designated Danube Delta Biosphere Reserve. Economic incentives dominated these events, driven by a high market demand for sturgeon meat and caviar (Congiu et al. 2023; WWF-CEE 2024). This illegal but lucrative occupation may be fueled by limited local economic opportunities and resistance to conservation regulations imposed within the protected area (Teodorescu and van den Kommer 2020).

Addressing poaching requires a multidisciplinary approach, as existing laws are often inadequately enforced (Gandiwa et al. 2013; Challender and MacMillan 2014; Fukushima et al. 2021). Furthermore, there are several knowledge gaps due to the difficulty of monitoring and documenting poaching events (Cardoso et al. 2021; Fukushima et al. 2021).

Most mass media articles offer limited information regarding the resolution of events, often lacking any follow-up. In 84.16% of events, it was only reported that the equipment used in poaching, as well as the game or fish involved, was confiscated and that a criminal case would be opened.

The enforcement of existing legislation, particularly in protected areas, is often emphasized for reducing poaching events (Plumptre et al. 2014; Critchlow et al. 2017). Although it is proven that law enforcement in protected areas is not enough to protect wildlife (Hilborn et al. 2006), many studies indicate that the population size of various species is larger in protected areas compared to those without such protection due to the existing restrictions and regulations (Geldmann et al. 2013; Kachel et al. 2017). For example, Hegerl et al. (2017) conducted a study comparing two protected areas that had similar ecological characteristics but different protection regimes: a national park and a forest

reserve. The results indicated that the national park, which had stricter regulations and more resources, had a considerably greater abundance of mammal populations compared to the forest reserve.

Periodic anti-poaching patrols conducted by rangers in protected areas demonstrated a reduction in poaching events (Flesher and Laufer 2013; Moore et al. 2021). Increasing the number of rangers in Romania's protected areas could enhance anti-poaching patrol efforts (Appleton et al. 2022). In the town of Baile Tusnad (Harghita County, Romania), local authorities, with the support of the community, have established properly equipped intervention teams to respond when brown bears enter the city (Papp et al. 2023). Similar anti-poaching teams could be formed to monitor regions affected by poaching by identifying potential individuals and rigged traps, which are often used for the illegal capture of animals in Romania (Pop 2019).

The rise in poaching events has necessitated the development of various technologies to identify and combat this issue (Bondi et al. 2018). One method for detecting poaching events is the use of trap cameras, which are increasingly utilized in wildlife monitoring (Green et al. 2023), as they provide a non-invasive approach (O'Connell et al. 2011). Analyzing and processing video footage requires a considerable amount of time (Young et al. 2018; Glover Kapfer et al. 2019), which may lead to some relevant sequences being overlooked (Scotson et al. 2017; Green et al. 2023). To address this issue, some researchers have turned to public engagement by implementing citizen science projects (Meek and Zimmermann 2016; Green et al. 2023), such as the eBird project (Sullivan et al. 2014; Callaghan and Gawlik 2015). Implementing such projects in Romania may assist in identifying poaching events (Pernat et al. 2024) by tracking trends in population distribution and pinpointing possible hotspots of decline (Horns et al. 2018; Cornell Lab of Ornithology 2025), potentially due to poaching. Furthermore, engaging volunteers in the field may deter poachers and encourage greater community engagement (Peterson et al. 2025).

Due to the increasing prevalence of artificial intelligence (AI), various techniques have been studied for their effectiveness in detecting poaching events (Di Minin et al. 2018; Xu et al. 2019). For example, Xu et al. (2019) employed a machine learning algorithm to analyze texts shared on social media related to ivory or pangolin trafficking, which led to the identification of 53 suspicious media posts. Although investigating social media posts to detect poaching events may be a useful tool, doing so manually is time-consuming; however, machine learning algorithms can significantly enhance the effectiveness of this process (Di Minin et al. 2018; Kulkarni and Di Minin 2023; Lynam et al. 2025). In Romania, several poaching events have been discovered following public complaints about various media posts that showcased animals being tortured or hunted illegally. Thus, a specialized AI tool scanning public social media platforms in Romania may identify other possible poaching events in the future.

While enforcing anti-poaching actions remains essential, it is equally important to develop strategies that enhance the tolerance of local communities and promote coexistence (Cooney et al. 2017). This presents a challenge for conservationists and authorities, as they must balance the needs of local communities and the affected species (Savage et al. 2010). Therefore, collaboration among stakeholders is essential for preventing conflicts that could lead to increased poaching events (Moshier et al. 2019).

Although local communities' involvement in the decision-making process is uncommon in Romania (Manolache et al. 2018; Nita et al. 2018, 2022), such initiatives may assist in reducing the acceptance of poaching and fostering new economic opportunities (Biggs et al. 2017; Cooney et al. 2017; Di Minin et al. 2022). Community tolerance of poaching can mask the severity of the issue, leading to reduced reporting of such events and even a tendency to protect poachers, who are often members of the community (Ballesteros and Rodríguez-Rodríguez 2018; Lapinski et al. 2025). This phenomenon is particularly pronounced in the case of strictly protected species, given the more severe consequences (Parliament of Romania 2006). Furthermore, tolerating poaching poses a serious threat to biodiversity conservation, underscoring the need to increase public awareness and engagement to address the problem.

Preventive strategies should not only focus on developing actions against poaching but also on addressing the socioeconomic needs of individuals driven to poach, which is often overlooked (Challender and MacMillan 2014; Duffy et al. 2016). Authorities must look beyond the legal aspects of poaching, which frequently contribute to the negative portrayal of poachers, and tackle the underlying socioeconomic drivers, such as poverty and lack of economic alternatives (Massé 2019; de Jong and Butt 2023). These issues can be addressed by creating viable livelihood opportunities, such as jobs linked to local wildlife management or ecotourism (e.g., birdwatching, guided tours, aquaculture) (Battista et al. 2018; Teodorescu and van den Kommer 2020) or by providing financial support or community benefits. This is especially important in areas with limited economic diversity, such as fishing communities, where people resort to poaching to sell meat and derived products.

Conclusion

Our findings indicate that the high demand for bushmeat, animal-derived products, and trophies on the black market remains the primary driver of poaching events in Romania. This is evident particularly in the case of ungulate and fish species, which are among the most sought-after by poachers due to their commercial value (Zhang et al. 2008; Gandiwa et al. 2013). Furthermore, the results emphasize the broader challenges facing Romanian wildlife, namely the low tolerance toward large carnivores, which are often involved in conflicts (Pătru-Stupariu et al. 2020; Neagu et al. 2022). This issue also extends to other taxa, such as ungulates, which are frequently associated with agricultural damage (Linnell et al. 2020), or predatory birds that are perceived as threats to poultry.

Understanding these incentives is essential for addressing the root causes of the problem (Montgomery 2020). With this knowledge, authorities can develop targeted prevention and intervention strategies that are tailored to specific incentives (e.g., trophy hunting versus subsistence hunting) to develop appropriate responses and reduce the likelihood of future events (Kühl et al. 2009; Duffy et al. 2016; Bergseth et al. 2017).

Our study also highlights regions where poaching must be managed more carefully by authorities. For instance, in the case of large carnivores, most poaching events were reported in the central and eastern Carpathians, which are known for a high density of carnivores (Popescu et al. 2017; Pop et al. 2018). On the other hand, the Danube Delta continues to attract poachers tar-

geting protected bird and fish species, endangering their conservation (Vickery et al. 2014; Bairlein 2016). Furthermore, this highlights the issue of residents resorting to illegal activities due to a lack of economic alternatives in the area (Successful Wildlife Crime Prosecution in Europe 2022).

The inadequate enforcement of existing laws (Gandiwa et al. 2013; Challender and MacMillan 2014; Fukushima et al. 2021), along with limited resources for expanding the workforce dedicated to anti-poaching efforts, such as anti-poaching patrols (Moore et al. 2018), and insufficient funding for innovative monitoring technologies (e.g., drones and AI-based systems), significantly hinders the prevention of poaching events (Challender and MacMillan 2014). These challenges are further exacerbated by the deficiency of credible official data and the absence of evidence-based strategies (Lavadinović et al. 2021), which undermines conservation efforts and intensifies poaching pressure on Romania's wildlife, thereby contributing to biodiversity loss.

Despite its limitations, particularly the reliance on media-based analysis, this research provides a valuable foundation for future studies on poaching in Romania. Its findings can support authorities in developing evidence-based anti-poaching strategies and intervention protocols aimed at reducing poaching incidents across the country.

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Supplementary material 1

Appendix A

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Data type: docx

Explanation note: **table A1.** Number of poaching-related articles per year (2007-2024). **table A2.** Number of poaching-related articles per month (2007-2024). **table A3.** Seasonal distribution of poaching-related articles (2007-2024).

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Artificial Intelligence (AI) use

The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI.
No AI tools were used in the preparation of this manuscript.

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Author contributions

Conceptualization: ACN, LR. Data curation: ACN. Formal analysis: LR, ACN. Methodology: LR, ACN, SM. Validation: SM. Visualization: LR, ACN. Writing – original draft: ACN, LR. Writing – review and editing: SM.

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Data availability

Relevant data supporting the results of this study are presented in the main text and supplementary material. The full dataset is available from the corresponding author upon reasonable request